

# PATENT SPECIFICATION (11)

1590540

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## (54) TILES

(71) We, FORBO-FORSHAOG AB, a Swedish Company of Datavägen 15, 436 00 Askim, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement—

The present invention relates to a method of producing thin flexible tiles, particularly floor tiles.

When tiles are used to cover floors, there is a possibility that uneven joints will occur between the tiles. Uneven joints may occur due either because of the laying operation, for example due to an uneven foundation, or alternatively because of an edge of a tile becomes raised, for example due to damage or due to interior stress occurring if the glue loses its grip on a glued tile. Such uneven joints present the risk of someone catching their foot on the edge of the tile or of an object being dragged over the floor getting caught at the edge. Under these circumstances the whole tile or a part of it may be torn loose from the foundation, resulting in the destruction of the tile. Also, the risk of an accident when someone catches their foot on the torn up tile is great. In any case, the damaged tile becomes an obstacle. Usually a slightly uneven portion of the edge causes someone or something to hit the edge and thus the edge of the tile is raised further. The next time this occurs, the whole tile is torn up. Such disadvantages due to uneven joints occur mainly in floors covered with relatively thin tiles, but also may occur with covering tiles for table tops, benches, and wall surfaces where uneven joints can cause problems and results in a flawed surface.

These disadvantages may be avoided if the tiles do not meet each other along their joints at full thickness, but instead are chamfered or sunk relative to the rest of the tile along their edges. However, it is very difficult to provide tiles of thin plastically moldable material, such as the non-rigid plastics of the kind at present used for flooring, which are laid out in long sections from wide rolls. Using such materials, shaping by means of a cutting operation, for example, by grinding

material from the edges of the tile, is not possible because of practical reasons and due to the expense of manufacture. If manufacture is to be economic it is not possible to manufacture the tiles by die casting, giving the tile a suitably shaped profile. An economically advantageous method of manufacture involves the cutting and/or stamping out of the tiles of a material made in a web of long extension.

According to the present invention there is provided a method of producing thin flexible tiles made of plastics material, having a base surface intended to lie on a foundation, and a free surface opposite the base surface, comprising:

forming a layer of plastics material containing a foaming agent, and

foaming the plastics material so that narrow edge portions of the tile are foamed to a lesser thickness than the portions inside said edge portions, thereby to produce a relief structure on the free surface of the tile in which said edge portions are sunk relative to portions inside the edge portions.

By the present invention it is possible to provide a method by means of which covering tiles can be manufactured in an economic manufacturing process so that the tiles have a sunk portion along their edges.

The method of the invention may thus be performed by manufacturing a layer of material of substantially uniform surface intended to form the free surface of the tile; providing the free surface with a design in relief, the surface having sunk portions. The design is applied so that narrow edge portions forming the sunk portions of the relief design are produced along the edges of the tile. A design may thus be applied to the tile along its outer edges so that it exhibits an unbroken narrow border zone forming part of the sunk portions of the relief design. Inside of and adjacent to this border zone there is a portion which is raised with respect to the border zone and forms part of the raised portions of the relief design. This portion forms a supporting edge for the protection of the outside edges of the tile against mechanical damage, the material in

the raised portions being porous and homogeneous, the sunk portions being less porous.

Embodiments of the present invention will now be described in detail, by way of example, with reference to the accompanying drawing, wherein:—

Fig. 1 is a view of the front surface of a tile and a part of a second tile;

Fig. 2 is a cross section along the line 1—1 shown in Fig. 1; and

Fig. 3 is a detailed view of an edge portion of a tile according to the present invention.

Referring first to Fig. 1, the tile comprises a layer 1 of plastics material with a thickness of a few millimeters laid on a foundation 2. The foundation 2 is preferably made of fibre, for example, fibre glass, made in the form of a non-woven material. The outside of the plastics layer 1 is provided with a design 3 and 4 preferably of several colours and shaped as a relief with certain portions of the design being sunk in the surface as shown in Fig. 1. It is convenient to provide the plastics layer 1 with a thin transparent coating of plastics material with great resistance to wear and other damage, the coating covering the design thereby to protect it.

In order to make the sunk portions at the edges, which form the joints, a technique must be used which makes it possible to form these sunk portions in the correct place relative to the design. One of the following methods, can be employed for this purpose. In a first embodiment the foundation 2 is covered with a fluid plastics compound, such as a plastisol, containing a foaming agent, i.e. a material which disintegrates and forms a gas or gases when heated above a certain temperature. The foundation covered with the plastisol is heated to a temperature below the temperature of disintegration of the foaming agent. It has then sufficient strength to permit it to be printed. At least one of the printing inks used contains substances which influence, e.g. inhibit the foaming agents. After heating up the fermentable layer of plastisol to gelation temperature the printed surface elements do not exhibit any foaming or only a small degree of foaming, i.e. they form sunk portions relative to the rest of the tile in perfect relationship to the printing ink or inks as distinguished from the non-printed portion or portions printed with normal printing inks.

According to a second embodiment the foundation 2 is coated with a plurality of differently coloured plastics materials by means of printing patterns, at least one of the plastics compounds containing a foaming agent in a concentration differing from the other ones, or with a different foaming capacity. Preferably the plastics materials which form the sunk portions do not contain any foaming agent or contain less foaming agent than the other plastics materials.

Both these methods make it possible to provide suitable conformity between the sunk portions and colour designs and are thus very well suited for providing the material with sunk portions in the zones which constitute the edge portions of the tiles. A gradual reduction of the thickness of the joining portions is obtained, which provides an additional protection against mechanical damage.

Preferably, when converting material in the form of long webs into tiles, there is utilized an in itself known method in which the web passes through a stamping press, the punching tool of which corresponds to the desired shape of the tiles.

The pattern can be designed in different manners according to aesthetic requirements, provided that a sunk zone of limited width extends along the edges of the finished tile. The groove shaped along the joint 5 between the tiles should not be excessively wide. The edges of the groove may receive impact from objects which might otherwise cause damage to the joined edges. The design of the mid-portion of the tile is of no importance in the present invention.

The method for manufacturing floor tiles according to the invention thus forms a relief design of the plastics layer 1 of the tile, with a pattern such that the tile is provided along its edges with a narrow zone of the relief design, which is sunk relative to the zone located nearest thereto.

The relief design is preferably made by printing the design on a foamable plastics material using an ink, which has the property of at least partly inhibiting foaming. On account of aesthetic reasons it may be of advantage that this zone is printed with a dark colour, whereby possible openings in the joint 5 are virtually unnoticeable.

The result which is provided by this method, is shown in Fig. 3. In this figure the plastics covering 1 contains a number of gas bubbles 6. The pattern portions 3 along the edges of the tile have been printed with an ink so that the gas bubbles within a zone 7 have been reduced with a resulting sunk portion at the edges.

As is evident from the preceding description, no mechanical material-removing machining is employed to produce the sunk portions. This has the additional advantages that the invention may be applied to tiles which exhibit edge contours of curved shape, and in addition that the manufacture of the counter sunk recesses will not influence any coating on the tile. If chemical methods are used for making the countersunk recesses it is on the whole unimportant, with respect to the manufacturing cost, if the edges of the tile are straight or curved. It is clear that in a mechanical machining operation edges exhibiting a curved contour would give rise to

considerable inconvenience in manufacture of the sunk recesses extending along the edges.

5 WHAT WE CLAIM IS:—

1. A method of producing thin flexible tiles made of plastics material, having a base surface intended to lie on a foundation, and a free surface opposite the base surface, comprising:
  - 10 forming a layer of plastics material containing a foaming agent, and
  - foaming the plastics material so that narrow edge portions of the tile are foamed to a lesser thickness than the portions inside said
  - 15 edge portions, thereby to produce a relief structure on the free surface of the tile in which said edge portions are sunk relative to portions inside the edge portions.
2. A method according to claim 1 wherein a part of the surface of said plastics material is printed with substance or substances which inhibit the foaming of said plastics material, thereby to form said narrow edge portions.
- 25 3. A method according to claim 1, wherein a plurality of plastics materials having different foaming capacities are used, the plastics materials arranged on a substrate to form a desired relief pattern.
- 30 4. A method according to any one of the preceding claims, wherein the free surface of the tile is covered with a thin transparent coating of plastics material having a resistance to wear, to protect the free surface of the tile.
- 35 5. A method of making a tile substantially as any herein described with reference to the accompanying drawing.
- 40 6. A tile made by a method according to any one of claims 1 to 5.
7. A tile substantially as herein described with reference to and as illustrated in the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of  
the Original on a reduced scale

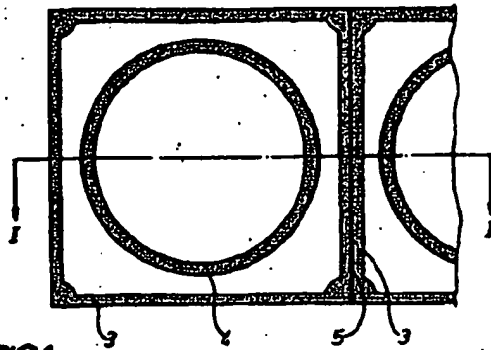


FIG 1

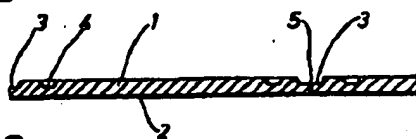


FIG 2

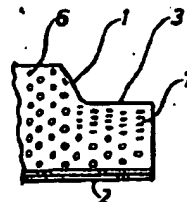


FIG 3